Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

32, Victoria St., London, S.W.1.

Edited by J. STEWART DOW

Telephone: ABBey 5215

Vol. XXXI.—No. 5

May, 1938

PRICE NINEPENCE
Subscription 10/6 per annum, post free

Principal Contents:

Wanted—A Hallmark!

AN important chapter in Illuminating Engineering opens with the publication of the Syllabus of Examinations by the City and Guilds Institute, set out in the appendix to Dr. Whitaker's recent paper (see pp. 111-113).

Such examinations pave the way for something that is now badly needed—**a "hallmark"** to identify those who have expert knowledge of illuminating engineering and can advise on lighting problems.

We have several times pointed out the anomaly—that whilst good opportunities with lighting firms exist, there are so few openings for the independent lighting expert, so few appointments in Government Departments and in large public and industrial undertakings for him to fill.

The first and main difficulty is doubtless that public opinion does not even now realise the need for independent expert advice. A second is the absence of the "hallmark." We are now well on the way towards removing the second difficulty. Persistent educational efforts will ultimately eliminate the first too.

Luminescent Materials

The applications of luminescent materials afford a most fascinating field for study. Mr. Lamplough's paper before the Illuminating Engineering Society, little more than two years ago, reviewed existing knowledge of such materials and especially the use of fluorescence and phosphorescence in various fields of analysis. Mr. J. W. Ryde's paper on April 12 carried matters a stage further. This lecture, admirably delivered and illustrated by many striking and informative experiments, attracted what was doubtless the record attendance for the present session. The latter interesting portion of the paper, in which the application of luminescence to electric discharge lamps was discussed, was particularly interesting. Such materials can be of no service in diminishing loss of energy in thermal and infra red radiation. They can, however, help considerably by utilising the radiation emitted in the ultra violet, which may be as much as 15-20 per cent. of the total radiation, as compared with about 12 per cent. visible light-energy. The use of luminescent powders, such as cadmium sulphide, to improve the spectrum of the discharge lamps is now familiar. Possibly even more interesting, however, is the use of such materials to convert the powerful short wave u.v. radiation present in neon lamps into visible light. Mr. Ryde mentioned a variety of substances with which experiments are being made and with which a remarkable range of colours can be produced. The degree of efficiency attainable naturally depends on how much consideration is paid to colour of light. With zinc orthosilicate, which yields a bright green light, an efficiency of 50-60 lumens per watt can be attained, and in the laboratory even higher values—as much as 100 lumens per watt, which is in advance of the efficiency gained in any other known electrical illuminant—have been recorded.

Lighting Fittings of Porcelain

Whilst the use of porcelain for certain forms of electrical equipment (insulators, ceiling roses, etc.) is familiar it has not hitherto been applied to any great extent in the actual lighting fitting, for which the use of metal is general. In Germany, however, in order to meet the desire of the authorities to lessen the import of metals, makers of lighting fittings are producing them with both straight and curved portions executed in porcelain. Specimens of such fittings were recently illustrated in *Licht und Lampe*. Apparently they meet practical requirements in a much greater degree than has hitherto been found possible, and they are stated to be proving popular with the public. One of the chief drawbacks of porcelain—its brittleness—has been partly overcome by making the fittings with interchangeable parts which can be detached, packed in a small space and reassembled for the job.

A New Inspector of Lighting in Aberdeen

We learn that Mr. Alexander Forbes, for many years Inspector of Lighting in Aberdeen, is retiring at the end of the present month. Members of the Association of Public Lighting Engineers and the Illuminating Engineering Society, who recall the enjoyable A.P.L.E. Conference in Aberdeen, in 1934, and the great amount of trouble then taken by Mr. Forbes for the pleasure of visitors, will join us in conveying good wishes to him in his well-earned retirement. We now learn that Mr. Forbes is to be succeeded by Mr. Ronald Parker, who has been acting as assistant to the Public Lighting Engineer of Sheffield, Mr. J. F. Colquhoun, and will take up his new appointment on June 1.

Sydney's 150th Anniversary

Through the courtesy of Mr. A. P. Turnbull, of the N.S.W. Department of Railways, we have received a copy of the *Sydney Mail* which illustrates the special lighting during Sydney's 150th anniversary celebrations. The chief items included firework displays, the famous harbour bridge floodlighted, and the Town Hall outlined in electric lamps. Coloured floodlighting was extensively used for buildings and parks. History was portrayed in a floodlighted group in the Harbour Pageant. An ingenious display was the illuminated launch owned by Mr. H. Newman, the Secretary for Railways, which carried a device in white calico stretched on a framework of timber and wire netting, prepared and lighted by members of the railways lighting staff. The calico was illuminated from behind, about 125 lumens per sq. foot being allotted, and the high brightness gave a pleasing impression of mother of pearl. Current was supplied from a 225 amp.-hr. battery. This boat was awarded the first prize offered for the best illuminated launch.

Illuminating Engineering:

Training and Opportunities

In what follows we give a summary of the paper presented by Dr. J. W. Whitaker, of the Huddersfield Technical College, at the recent Annual General Meeting of the Association of Technical Institutions. In this paper Dr. Whitaker, who is one of the "Privileged Members" of the Illuminating Engineering Society, explains to those concerned with courses of technical instruction what is involved in "Illuminating Engineering." The paper was a very opportune one in view of the issue of the Syllabus of Examinations in Illuminating Engineering initiated by the City and Guilds Institute, which is given in full in an appendix.

There is a real and recognised danger that in the struggle to make the content of syllabus and curriculum serve the needs of each successive generation the pace be not maintained, and that the teaching begin to lag behind industrial practice. Technical institutions, to justify their existence, must keep pace with the requirements of the day.

In some branches of knowledge the divergence between pure and applied science (which should hardly exist) has become marked. The subject of Heat is seldom taught as an introduction to heating, and the subject of Light is similarly divorced from the subject of lighting. Similarly the physics and chemistry of the air, as commonly taught, seem to have little connection with ventilation. Yet the lighting, heating, and ventilation of buildings and premises of all kinds affect the daily lives of everyone.

To confine the discussion to lighting, should we not make a plea for the inclusion, in all technical courses, of some information on "applied light." Lighting is literally of importance to every technician. The problem, however, will not be solved in a satisfactory manner unless we go back to the secondary schools and the science text-books, where the student first meets the subject of Light. Here he should also meet the subject of Lighting. Confusion between candle-power and foot-candles, between brightness and reflection ratio, and between other fundamental concepts would then be less frequent in later years. Is there any reason why a youth of sixteen or seventeen years of age should not be well aware of the difference between specular and diffusd reflection and have a just appreciation of the influence of the reflection ratio of the walls on the illumination and general lighting effects in a room? The young people of to-day will, in due course, all be connected with lighting problems—as managers of factories, mills, or mines, as business or professional men. Even the humblest will meet the problems connected with the proper lighting of the home. It is only plain sense to disseminate the elements of the study of lighting in the courses certainly of technical colleges and, if possible, in the secondary schools.

Twentieth-Century Developments in Lighting.

Thirty years ago the carbon filament electric lamp was displaced by the vacuum metallic filament lamp, which, in turn, gave place to the gas-filled lamp, equipped, since 1934, with the coiled coil filament Each stage represented a marked gain in efficiency. To cover the range we have at one end of the scale carbon filament lamps with an efficiency of 3.5 lumens per watt, contrasted with discharge lamps yielding 55 lumens per watt—sixteen times the earlier quantity. In gas lighting a series of similar advances, perhaps not so startling, but none the less real, has been made. The substitution of the incandescent mantle and burner for the old flame burner was a remarkable step forward, and the modern use of high-pressure gas has carried the movement a step further. Even in the use of daylight—in what is termed natural lighting — considerable progress has been made.

There has likewise been a steady advance in the standards of illumination generally adopted. Twenty years ago one foot-candle was considered adequate illumination for ordinary purposes. To-day we ask for five, ten, or twenty. Are these values excessive? The daylight illumination derived from an overcast sky is, on the average, 500 foot-candles, yet one seldom complains of excessive light on overcast days. Is it not more likely that the high values of to-day will be considered as really inadequate in another twenty years? Moreover, artificial light has become cheaper with each step forward, so that the illuminating engineer is devoting as much attention to the quality and distribution of light as the quantity. Deficient lighting is now easily noticed by the public, easily demonstrated and measured by portable illumination photometers, and easily rectified by the installation of the proper lighting equipment. Nevertheless, there is still ample room for mathematical investigation. The quality of light, the aesthetic problems involved in the proper choice of light sources, the different kinds of globes and fittings, and the skilful use of light for various effects, are problems now to the forefront in the field of modern lighting.

The Illuminating Engineer—Preliminary Training.

In spite of the apparent simplicity of much of the work, a proper understanding of the art of applying light requires study and thought, a developed aesthetic sense and a grasp of many technical subjects. There is need of a knowledge of physics, general chemistry, and mathematics and of the technique of gas and electricity supply. A young student aiming at the profession of illuminating engineering should first obtain the standard of education involved in an Ordinary Grade Certificate in Gas or Electrical Engineering. Suitable preliminary courses are those leading to the Higher School Certificate or the Intermediate Examination for a Degree in Physics, supplemented by some knowledge of Engineering, Drawing, and Design. National Certificate holders will, as a rule, be in need of a fuller study of Light. However, as openings for Illuminating Engineers are as yet limited, Illuminating Engineering is best regarded as an ancillary subject in which students may specialise when the opportunity arises.

Specialised Training.

For some time the need for specialised training and examinations has been recognised by the Illuminating Engineering Society and the Association of Public Lighting Engineers. Experts from these and other bodies have recently collaborated with the City and Guilds of London Institute in drafting syllabuses for examinations in Illuminating Engineering. It is proposed to hold the examination in two grades, Intermediate and Final—the former being compulsory.

For the Intermediate Examination the scheme assumes a specialised study of Lighting by students of not less than eighteen or nineteen years of age, the ancillary subjects being Mathematics, Optics, Engineering, Drawing, and Art. The Lighting Syllabus is set out in the Appendix. For the Intermediate Examination a course of two or three evenings per week, extending over two years, will probably prove necessary to cover both the Lighting and ancillary subjects.

In considering the Final Grade (the syllabus for which is also summarised in the Appendix), it was felt that the Lighting Engineers of the future would be drawn mainly from two sources: (1) University Graduates in Physics, Physiology, and Engineering; and (2) Engineers or Architects who had passed

through a National Certificate or Diploma Courses. To meet the needs of both types the Final Grade was divided into two sections, A and B, which might be taken in different years.

Openings in Illuminating Engineering.

Some idea of the magnitude of the field and of the interest taken by those in responsible positions may be gathered from the membership lists of the Illuminating Engineering Society and the Association of Public Lighting Engineers. The British Electric Lamp Manufacturers Association alone spends more than £200,000 per annum on the technique of lighting and the gas companies have by no means abandoned the field to their competitors. Openings for qualified research workers are thus fairly numerous, and there are many opportunities in the services of the leading firms in the lighting industry, where the design and planning of lighting installations and equipment are undertaken. The lighting of coal mines, capable of so much improvement, is a field in itself. Compensation costs alone amount to about £400,000 per annum. The number of openings for public lighting engineers continues to grow. The lighting of only moderately large towns and cities involves an annual expenditure of some £100,000, and such work requires supervision by properly qualified illuminating engineers. On the other hand there are few opportunities as yet for consultants on illumination problems. However, the lighting of factories and schools, including technical colleges, requires more and more skilful attention, and it would seem that appointments of qualified experts in these fields are by no means improbable.

APPENDIX.

Examinations in "Illuminating Engineering," held by the City and Guilds of London Institute.

The scheme of examinations and syllabuses relating to Illuminating Engineering is arranged in two grades, Intermediate and Final, the Final Grade being divided into two sections, A and B. The Intermediate examination will be of a standard which a candidate may normally be expected to reach after a course of part-time instruction extending over a period of two years, and it is anticipated that a candidate will require a further one or two years' study to prepare for the Final Grade examination. It is expected that the student's progress will be tested at appropriate stages of the course by means of examinations conducted by or on behalf of the College Authorities.

Students entering upon the Intermediate course should normally have studied Mathematics to the standard of a Third Year Senior Course, and Engineering Drawing to that of a First Year Senior Course. Similarly, a knowledge of elementary chemistry, also of light and electricity up to the Intermediate B.Sc. standard, together with some acquaintance with the principles of alternating currents, is essential. Initial deficiences in this respect should be made good by a suitable course of study during the Intermediate course. Students who have obtained the Ordinary National Certificate in Mechanical or Electrical Engineering, or the Ordinary Grade Endorsed Certificate in Gas Engineering (Manufacture or Supply) of the Institution of Gas Engineers, will have reached the requisite stage of knowledge in Mathematics and Engineering Drawing, but will usually have to make some additional study of Physics and Chemistry. It is accordingly recommended that two evenings per week be devoted to the study of Illuminating Engineering and, where necessary, a third evening to ancillary science subjects.

Certificates of the First or Second Class will be awarded to successful candidates in the Intermediate examination, in Section A of the Final examination, and in Section B of the Final examination, according to the standard attained in the examination.

The Intermediate, Final Section A and Final Section B examinations will each consist of a question paper of three hours' duration, to be answered in writing and with sketches where necessary. The examination questions will be based upon the respective syllabuses set forth below.

INTERMEDIATE GRADE.

SYLLABUS:—

1.—Light Production and Control.

Radiation from a hot body; the spectrum, visible and invisible.
Brief description of other forms of light production—luminescence, fluorescence, and phosphorescence.
Electric discharge in gases.
Colour, and effects of the colour of the source.
Study of reflection (specular and diffused), refraction, transmission and absorption of light.
Simple polarised light.

2.—The Eye and Vision.

The eye; physiological optics; sensitivity to light intensity and colour; persistence, adaptation, fatigue, phenomena of glare, visibility and contrast.

3.—Photometry.

The measurement of light intensity from a point source.
Inverse square law and oblique incidence.
Photometers, including photo-electric cell.
Candle power, units and standards; mean spherical and hemispherical candle power; luminous flux and the lumen; comparison of candle power of sources of similar colour; polar diagrams and their use, including Rousseau diagram and Russell angles; iso-candle diagrams; globe and other integrating photometers.
Line and surface sources.
The measurement of illumination; British and Metric units; the foot-candle and the lux; illumination-photometers; iso-lux diagrams; brightness and its units.

4.—Practical Light Sources.

Daylight: qualities of daylight; admission of daylight into buildings; daylight factor and sill ratio.
Gas: the bunsen burner; various types of burner used in lighting appliances; high and low pressure fittings; the incandescent mantle, various types, their care and use; composition, properties and combustion of gases; products of combustion.
Lighting by acetylene, paraffin oils, petrol-air gas, oil gas (Pintsch).
Electricity: arc lamps; incandescent filament lamps, vacuum and gas filled; vapour discharge lamps.
Fittings of various types; properties of glassware used for lighting equipment; reflectors, refractors, diffusors, globes, shades and the effects on the amount and distribution of light.

5.—Illumination.

Effect of degree and nature of lighting in various situations; illumination required for various purposes; B.S. Specifications for illumination; rules for avoidance of glare; shadow conditions; opportunities for general and local lighting; direct, indirect and semi-indirect lighting; reflection of light from walls and ceilings; application in industry of fully diffused and unidirectional light; conditions for colour discrimination; elementary study of practical lighting problems in houses, factories and streets; calculations necessary for spacing, height, and positioning of lamps; aesthetic problems and architectural lighting.

6.—Distribution and Control Systems.

A descriptive treatment of the following:—
High and low pressure gas distribution systems; remote and automatic control apparatus.
Electricity: distribution systems, mains, switch-gear, and protective apparatus.
Factors involved in costing of various methods of lighting; tariff schemes.

FINAL GRADE.

Every candidate for the Final examination must satisfy the Authority accepting his entry for that examination that he has passed the Intermediate examination. The responsible officer of a Local Education Authority or Technical Institution is requested to ensure that this condition is fulfilled at the time when he accepts the candidate's entry.*

The question paper in the Final examination will be divided into two sections, A and B, based on Sections A and B of the syllabus. Questions of a more advanced character may also be included on the subject matter of the Intermediate syllabus. Candidates may enter for one Section of the examination, *or* for both Sections in the same year, *or* for the two Sections in different years.

SYLLABUS:—

SECTION A.

Radiation and Light Production.

More advanced study of radiation; wave theory; quantum theory; line, band, and absorption spectra.
Spectra of incandescent solids and effect of temperature on efficiency; brightness temperature; colour temperature.
Selective radiation and luminescence, fluorescence, and phosphorescence.
Spectral energy curves; infra-red, visual, and ultra-violet; spectral distribution from common light sources, including electrically-excited gases and vapours.
Influence of particular spectra on appearance of coloured objects.
Photo-electricity.

The Eye and Vision.

More advanced study of vision and visual processes.
The retina; peripheral and foveal vision.
Sensitivity of the eye throughout the visible spectrum.
Vision at low intensities; dark adaptation; threshold measurements. Fechner's Law.

* No Advance Grade Examination will be held by the Institute in 1939.

Colour vision by strong and weak light; the Purkinje effect.

Trichromatic theory of vision and its application to colorimetry.

Photometry.

More advanced study, including light standards and the full equipment of the photometric laboratory; screening, auxiliary apparatus; sector discs; rotators.

Special problems of heterochromatic Photometry; the flicker photometer; yellow/blue ratio; use of colour filters.

Physical (photo-electric) photometers; their limitations and precautions in their use.

SECTION B.

Artificial Light Sources.

More advanced study of light sources and their equipment.

Mechanical and thermal properties of glasses of various compositions used for lighting equipment.

Optical properties of glasses and other reflecting media.

Use of refractors in lighting equipment; symmetric and asymmetric refractors.

Design of projection apparatus; beam divergence, headlights, searchlights.

Further study of modern gas burners, high and low pressure.

More advanced study of electric lamps, including vapour discharge lamps.

Lighting Installation.

More advanced study of the planning of lighting installations.

Natural lighting; co-efficient of utilisation, room index.

Calculation of illumination due to point, line, and surface sources.

Design for special applications, e.g., streets, factories and workshops, schools, shops, offices, and exteriors of buildings.

Influence of lighting requirements on architecture and building construction.

Organisation and administration of a lighting department. This will include a more detailed knowledge of factors affecting the cost of lighting and the various tariffs employed, British Standard Specifications, statutory rules and regulations relating to lighting, and methods of testing the useful life of equipment.

"Siting" for Lamp Posts

A good feature of the illustrated booklet issued by the British Electrical Development Association, summarising the contents of the Final M.O.T. report on Street Lighting, is the clear illustrations. By the courtesy of the Association we are reproducing several of these. The first of them (Fig. 1) shows at

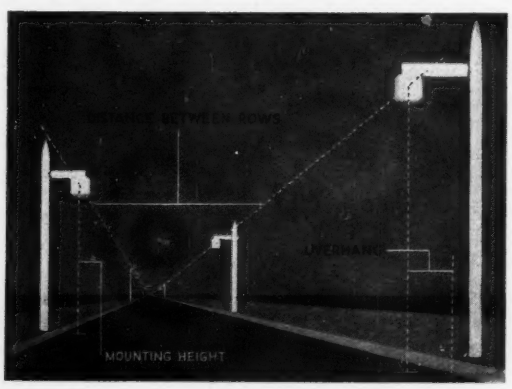


Fig. 1.

a glance the mounting height (which for Class A roads should be 25 ft.), the distance between rows, and the overhang (which, on carriageways up to 40 ft. wide, may be up to 5 ft. with advantage).

The other three illustrations (Figs. 2, 3, and 4) deal with "siting"—a factor in street lighting of very great importance, perhaps quite as important as distribution of brightness on the road-surface.

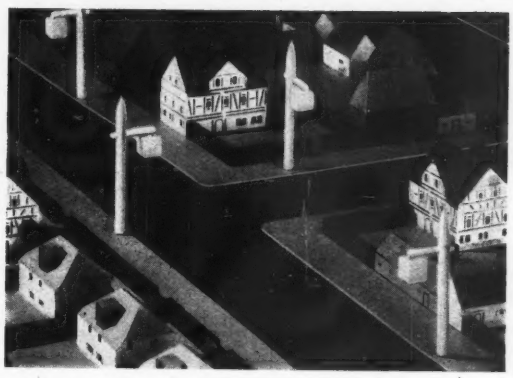


Fig. 2.

Fig. 2 shows the method to be adopted at a "T" junction, where a source should be placed in the main road immediately opposite the side road. In Fig. 3 we have an indication of siting at a roundabout. The solid arrows point to the approach road served by each of the lamps whilst the dotted arrow indicates the most important direction served by the lamp (only one shown) in the approach road.

Fig. 4 shows the treatment of an intersection in regard to which it is laid down that "where two

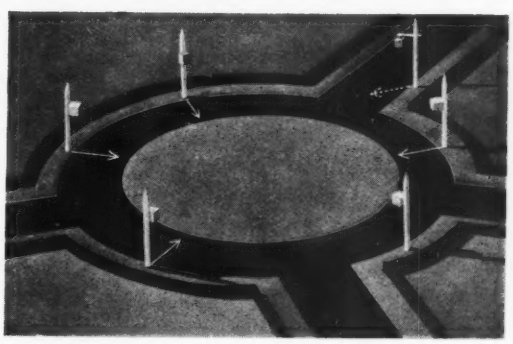


Fig. 3.

traffic routes cross at right angles there should be a source on the left hand side of the road just beyond but not too close to the intersection."

Another important point (also illustrated in the E.D.A. booklet) is the placing of sources on the *outside* of bends. In dealing with special curves, gradients and intersections, however, some discretion should be used. One important principle, to be applied whenever possible, is to secure an illuminated background against which approaching persons or vehicles can be clearly seen.

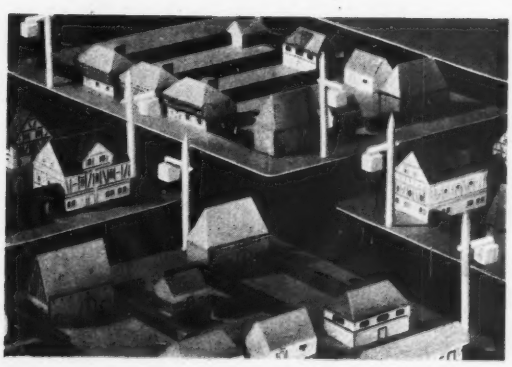


Fig. 4.

The M.O.T. Street Lighting Report

Discussion at the Meeting of the Public Lighting Section of the Illuminating Engineering Society, on March 4th, 1938.

The M.O.T. Street Lighting Report, discussed at the general meeting of the Illuminating Engineering Society on Feb. 8, again came up for detailed discussion before the Public Lighting Section a few days later. At a meeting, held by the courtesy of the Gas Light and Coke Company on March 4 at Watson House, Mr. F. C. Smith presided. The opening of the discussion was entrusted to Mr. G. S. C. Lucas and Mr. A R. McGibbon.

Mr. G. S. C. Lucas, in his opening remarks, pointed out two significant features of the report—the frequency with which the need for a "competent engineer" was emphasised or assumed, and the stress laid on the forthcoming British Standard Specification, as a supplement to the report itself. Critics should remember that this was a report, not a specification.

What lines would the coming specification follow? Would this, too, leave considerable latitude or would it prescribe details? This depended on its object—if intended for engineers, rather than for laymen, a broad basis might be expected. A too close specification, whilst ensuring the minimum result, might fail to secure the maximum benefit. A series of slides reviewed the various factors in the M.O.T. recommendations. Mr. Lucas regarded siting as the most important factor, mounting height and distribution next, then spacing and power of units, and, lastly, glare. This, however, was not necessarily the best order from the point of view of a standard specification. The recognition of two distinct groups, "A" and "B," must form the basis of any new standard specification. Agreement on the mounting height would greatly aid both the industry and the engineer, who, however, in bearing in mind the recommendations in regard to spacing and power of units, should look many years ahead. When planning his scheme he would do well to work near the upper limit of luminous output and the shorter spacing.

Amount of overhang was partly determined by kerb visibility which was certainly important but dependent on local conditions. The discretion of the engineer should, therefore, be exercised here.

Mr. Lucas commented on the important matter of siting, discussing the M.O.T. recommendations in some detail and asking how far sources should be regarded as "beacons," to indicate the route rather than illuminate it? Distribution was a matter left to the engineer, whilst glare was partly limited by the 5:1 ratio in the report. Mr. Lucas showed, however, two forms of polar curves, both coming within this limit, but, he thought, very different in regard to degree of glare arising. After briefly touching on road surfaces and conditions for carriageways Mr. Lucas concluded by again impressing on his audience the importance of the lighting engineer and the recognition of his status and authority.

Mr. A. R. McGibbon, who followed, suggested that rather too much was heard from suppliers of apparatus and energy and too little from those who had to use their creations! The report, as Mr. Lucas had said, should not be regarded as a specification, but on some points there seemed need for explanation. The figures of 5 and 6 in the glare clause were an example. The change from the "generously planned Class F" (readily met by a lumen output of 2,000 per 100 feet) in the interim report to the 3,000—8,000 lumens per 100 feet in the final report seemed to require some explanation—from the user's standpoint! Mr. McGibbon also drew attention to the anomaly pointed out at the general meeting, that 3,000 lumen lanterns spaced 120 ft. apart might be mounted 13—15 ft. high on "B" roads, whilst on "A" roads 25 ft. for very similar lanterns was considered necessary. Lanterns erected at heights of 18—20 feet might in fact give less glare than those at a height of 25 ft., even if both complied with the so-called glare ratio. To some the omission of any reference to colour was a surprise. Colour contrast and brightness contrast were both of importance in discerning objects, especially at the intensities met with in modern lighting.

A most difficult task for those concerned with the standard specification was the drafting of some means of appraising installations, a task at present left to the lighting engineer. He fully agreed in regard to the value of competent public lighting engineers capable of selecting equipment. The selection or condemnation of sample (often costly) installations by a small lay committee was a usual but a far from satisfactory method. Judgment in such circumstances often depended on factors outside the control of the engineer, such as atmospheric conditions and the nature and condition of the road-surface.

Amongst those who joined in the discussion were Mr. J. H. Burman, Mr. J. G. Christopher, Mr. F. M. Cocksedge, Mr. A. Cunnington, Mr. J. Dunbar, Mr. E. J. Elford, Mr. W. F. Griffiths, Mr. J. R. Heppell, Mr. R. Maxted, Mr. C. W. M. Philips, Mr. F. C. Smith, Mr. L. M. Tye, and Mr. J. M. Waldram.

Quite a number of speakers agreed in emphasising certain points such as the need for more qualified lighting engineers, the desirability of some basis of "appraisement," and the need for guidance in regard to what constituted "A" and "B" roads. Several speakers thought that a third intermediate class was necessary. The functions of the specification were discussed by Mr. Smith, who pointed out its importance as a basis of contract obligations, and by Mr. Maxted, who suggested that it might envisage future developments whereas the report was necessarily based mainly on past experience. There were several who disagreed with the order of importance of factors as suggested by Mr. Lucas—Mr. Elford and Mr. Cunnington attaching special importance to glare. The latter strongly supported the principle adopted in "cut-off" installations.

The meeting terminated with a vote of thanks to Mr. Smith for presiding and to the Gas Light and Coke Company for their hospitality.

Lighting Provisions in the New Factory Act

A novel and very successful plan was adopted for the meeting arranged by the Industrial Lighting Section of the Illuminating Engineering Society on March 29 when the above topic was discussed. In the lecture theatre of the Home Office Industrial Museum, where the meeting took place, it was possible to arrange a central table in the middle of the room. The audience sat round the table on rising tiers of seats—and it may be said that practically every one was occupied! At the central table there were seated the chairman of the section (Mr. R. O. Ackerley), Mr. H. N. Winbolt (National Safety First Association), Mr. D. Gluckstein (Messrs. J. Lyons and Co., Ltd.), Dr. S. English (President), and Mr. E. W. Murray (Home Office Industrial Museum). Each of the speakers set forth his view in turn and was "heckled" by others at the table. Finally members of the audience were allowed to join in by putting posers which the various speakers endeavoured to answer.

Mr. H. N. Winbolt, who started the ball rolling, whilst recognising that there was a good case for better lighting as an aid to accident prevention, pointed out that lighting was not the primary cause of accidents, but only a contributory cause. He also urged that in order that regulations should be definite and effective they should not make frequent use of such terms as "adequate," "sufficient," and "suitable," the meaning of which was a matter of opinion.

There was some argument about "primary" and "secondary" causes of accidents. If a person, owing to bad lighting, failed to see an object and tripped over it—was not the offending object the primary cause of the accident? (In this connection the chairman pertinently remarked that if the factory did not exist there couldn't be an accident!) Mr. Murray, however, claimed that one form of bad lighting—extreme contrast between bright light on the working plane and surrounding obscurity—was a primary cause.

Mr. D. Gluckstein, from the employers' standpoint, whilst expressing complete sympathy with the desire for better lighting conditions in factories, pointed out certain difficulties of interpretation and expressed uncertainty as to where the responsibility for proper lighting really rested. He also raised the point whether regulations should include wiring standards, what regard would be paid to rooms only visited occasionally by employees, and what consideration would be given to the maintenance of standards, once provided. Reference was also made to such special cases as cold rooms and dark rooms used for photography.

Dr. S. English commented briefly on the existing recommendations, expressing his personal view that they were in need of modification, for example, by reference to the "code" prepared by the Illuminating Engineering Society. Some discussion took place on the origin of the "five candle per square inch" as a limit to glare. Mr. Murray expressed the belief that it was based on the brightness of the moon whilst the chairman understood that it was the brightness of the sky. Dr. English was asked some questions in regard to the accuracy of instruments available for checking values of illumination.

Mr. Murray (who made it clear that he was expressing personal opinions only) explained various points raised by previous speakers, such as the value to be set on natural lighting, and emphasised the importance of good illumination in passage ways, etc., as well as on the actual work. He held that responsibility rested on the occupier, who should see that his contractor fulfilled requirements, and should be prepared to show, if necessary, that he had not relied only on his own judgment but had sought expert advice.

Other interesting points raised in discussion, included the effect of a drop in voltage in decreasing the available illumination, the reconciliation of divergent views expressed by different inspectors, and the circumstances in which portable lamps might be used. (One speaker went so far as to suggest that if a worker carried with him a portable lamp giving the requisite illumination in his vicinity any area through which he passed was apparently to be considered adequately lighted!).

Mr. A. Cunnington, in winding up the discussion, emphasised the distinction between legal minima and recommended values, and stressed the fact that the aim of the Society was to achieve a needed but reasonable improvement in lighting, not to demand extravagant conditions.

Mr. A. E. Iliffe proposed a vote of thanks to the four chief speakers, to Mr. Ackerley for presiding, and to Mr. Murray for the use of the lecture theatre of the Home Office Industrial Museum. The chairman stated in conclusion that during the next session there would be a discussion on the forthcoming report of the committee concerned with the revision of existing recommendations.

A Group at the Recent Dinner of the I.E.S. Centre in Leeds

We illustrate above a group, taken by artificial light, immediately before the recent dinner organised in Leeds by the North Midland I.E.S. Centre, which was the subject of reference in our last issue. The names of those in the group, reading from left to right, are Mr. J. D. Green, A.M.I.E.E.; Mr. R. N. Webb (Past-President of the Manchester Association of Gas Engineers); Mr. J. W. Howell, D.L.C., A.M.I.E.E. (local Hon. Secretary); Councillor Wadsworth Sellars (Chairman of the Centre); Dr. S. English (President of the Illuminating Engineering Society); and Alderman R. Winn (chairman of the Leeds Watch Committee).

They Turn Night Into Day

Under this title the *Evening News* (Saturday Supplement) recently included an illustrated account of an interview with Mr. J. S. Langlands, who, like his father, formerly Inspector of Lighting for the City of Glasgow, is a member of the Illuminating Engineering Society. The article, which forms one of a series on "The Other Chap's Job," reviewed recent developments in electric discharge lamps, and was illustrated by a photograph showing Mr. J. S. Langlands and Mr. A. D. Lees at work on neon tubes.

Artificial Lighting of Schools

By Frederic Evans, M.B.E., M.A.
(Director of Education, Erith, Kent)

Whilst much study has been devoted by experts to the lighting of schools, the importance of sympathetic co-operation by those interested in the scholastic side is evident. We are, therefore, glad to give publicity to the views expressed by Mr. Frederic Evans, an educationist, on this topic.

The days when a few clear glass lamps set in blue and white enamel reflectors supplied the artificial light in schools are gone. Modern lighting equipment now takes their place, at any rate, in the newer schools and in the schools of the more progressive education authorities.

These changes which are taking place are part of the general trend in this age of new school building. The reorganisation of the schools under the recommendations of the Hadow Report on the Education of the Adolescent, which was issued in 1926, has resulted in a spate of school building. Also the post war tendency towards the development of housing estates on the outskirts of the large towns has made necessary the erection of many new school buildings in spite of the general fall in the numbers of children attending our elementary schools owing to the decline in the birth-rate.

School architects and electrical engineers have not been slow to take advantage of the erection of these new schools in order to specify lighting schemes on modern lines.

It may be, therefore, of interest to discuss the standards to follow and the conditions to be observed in specifying for a school its lighting installation. In this discussion I speak only from the point of view of the educationist and do not pretend to suggest specifications and supplies in the technical sense.

Psychological Effect

In the first place, a school—especially its classrooms and crafts-rooms—should be brightly lit whether by day or night. The psychological effect of plenty of light upon the attitudes and responses of the children is remarkable. Dull lighting produces dull children, quite apart from the harm which may be done to their eyesight in badly lit classrooms. Children learn better when they are happy, and good lighting has a cheering effect upon them. The badly lighted schools of Victorian times had their effect in the great increase amongst children in defects of eyesight. Even to-day nearly 30 per cent. of school children suffer from defective vision, and have to wear spectacles. Researches have also shown that children work faster and more accurately in a good light. A difference of as much as 25 per cent. in efficiency has been observed with children working in a good light compared with those working in an indifferent light. Thus, educationally, it is as necessary to build or remodel well lighted schools as it is to fit them with adequate heating systems or modern sanitation.

In the first place the light should be evenly distributed and well diffused. The modern opal fitting containing high powered lamps well distributed in the rooms are the most suitable types. Shallow reflectors of the blue and white enamel type are, therefore, unsuitable, as they leave dark spaces in the room and do not utilise the reflecting power of the white ceilings.

Light Schemes of Decoration

Incidentally, classrooms should be painted or distempered in a high key—broken or "off" white, cream, light stone, primrose, etc., are suitable. Even the woodwork can be, with advantage, painted in light pastel shades or even in an "off" white. Such a colour scheme gives the greatest return from the lighting equipment and causes that bright and cheerful outlook in the school as a whole. If enclosed fittings are not possible or cannot be afforded, then pearl lamps hung without a reflector and well distributed throughout the room will give satisfactory results.

The lights should be so placed in a classroom that they do not come directly in the line of sight of the pupils as they look towards the teacher or lecturer or towards the blackboard, map, or chart. Lights in the line of sight, especially bright lights, will cause unnecessary eyestrain and react unfavourably upon the learning capacity of the pupils. But with modern diffusing fittings and modern schemes of decoration, the lights can be placed high and yet produce a well-lighted classroom.

Standards of Illumination

It will be necessary to suit the light intensities in different parts of the school. For instance, corridors need not be so well lighted as classrooms; whilst for art rooms, needlework rooms and craftrooms, where fine measuring or fine work is done, the illumination can quite well be much more intense.

The following table gives the generally accepted standards of lighting in the various rooms:—

Type of Accommodation.	*Minimum Illumination.*
	At floor level.
Corridors and stairways	6 foot-candles.
Cloakrooms and ablution rooms	6 ,,
Latrines	6 ,,
Gymnasia	8 ,,
Assembly halls	8/10 ,,
	At desk or table level.
Handicraft and other practical rooms	12 foot-candles.
Needlework rooms	12/20 ,,
Art rooms	12 ,,
Classrooms	10/12 ,,
Libraries	10/12 ,,

These should be regarded as minima and, in designing the lighting scheme, allowance ought to be made for possible losses developing through fittings becoming dusty and lamps becoming old. At least 20 per cent. over the minimum can be allowed for this.

Apart from the general lighting, there is often need for special localised lights at certain points, such as a shaded light for the blackboard, and also directional lights in handicraft rooms at lathes, drills and other machinery. Spotlights shining into ovens in cookery rooms or lights for high-power reflections into microscopes are examples of these special needs. To ascertain these requirements the staff of the school or teachers working in schools of similar type should be consulted and their suggestions obtained.

Lanterns and Projectors

As part of the lighting scheme may be included points for the now popular film projectors, optical lanterns and epidiascopes. These should be provided exactly where they are required to avoid the undue use of flexes. Probably the best positions for optical lantern or film projector plugs are in the classroom ceiling, so as to leave the floor unencumbered with

electric light cables. If arc lights are used in the cinema it will be necessary to convert alternating current into direct current either through a rotary convertor or other kind of transformer.

In gymnasia or in halls used for physical training the lighting fittings should be designed to stand being hit by a soft ball or similar object. The light should be suspended close to the ceiling and covered with a metal lattice shield. In gymnasia protected bulkhead fittings are often let into the ceilings and walls.

In art and needlework rooms, where colour matching has to be done, daylight blue lamps are useful, in which case the wattage will need doubling to produce the best results. Steps and staircases must receive careful consideration and the lighting arranged so that it shines right into the angle of the steps and not across them. In any case, deep patches of shadow should be avoided.

Exterior Lighting

Not always is sufficient attention given to outside lighting, that is, to the proper illumination of entrances, approaches, gateways, passages and courtyards. Where schools are extensively used at night a well-planned and adequate scheme of exterior lighting is essential. Floodlighting of buildings much used at night might be seriously considered, especially during "enrolment" nights in schools where evening classes are organised. It is important, too, in central and other schools where evening classes are held, that a system of lighting based on the minimum laid down in this article should be established, as what might pass muster on a dull winter afternoon may not meet the more exacting needs of the evening schools.

Switching needs a word or two. The switches should be placed at about 5 ft. 6 in. from the ground and be of plain tumbler type. Switches with loose keys are no longer necessary in modern schools since electricity is becoming cheaper and the children more used to its provision. Two-way switching on staircases and in long corridors is important for simplicity of working and for saving labour. The lights of assembly halls and stage lighting sets associated with the stages of such halls should be so placed that they can be controlled from "backstage" and so obviate intricate systems of signalling between several people. Stage lighting installations are matters for specialists, and their consultation is strongly urged when such lighting is proposed. A modest stage-lighting set will need a much greater supply of electricity than even a needlework room.

For emergency lighting, "Exit" boxes and similar requirements, a gas supply, in addition to the electrical service, will be necessary.

Talks on Lighting in Schools

In the course of a couple of talks to teachers given by Mr. W. J. Jones at the E.L.M.A. Lighting Service Bureau on March 23 and 30 the need for a considerable improvement in the standard of lighting in many schools was strongly emphasised. The two lectures on "How to See" and "How to Obtain Good Lighting" were illustrated by a variety of lantern slides, specially prepared with a view to making lighting interesting to children. Sets of slides with accompanying notes for lectures are now available for use in recognised schools. At the conclusion of the second meeting Mr. G. H. Leslie, London County Council District Inspector of Schools, who presided, read out the following resolution, which was carried with acclamation:—"That this meeting of teachers advocates the inclusion of lighting in the curriculum of all schools and considers it desirable that a committee be formed to consider the character of such instruction."

Lighting at Blackpool Technical College

The attractive lighting scheme at the new Blackpool Technical College, which was opened some months ago by the Earl of Crawford and Balcarres, is a distinguishing feature of this new building.

The structure, which covers some 24,200 sq. ft., was planned and designed by Mr. A. Robinson, F.R.I.B.A., of the Borough Surveyor and Architect's Department, Blackpool.

The main entrance hall is illuminated by a number of specially designed G.E.C. hexagonal pendant

Fig. 1. Showing pendant fittings in the assembly hall.

fittings finished in real bronze colour with glazed panels of white flashed opal and amber sprayed rimpled glass, each housing a 200 watt lamp. From the ceiling of the grand staircase similar fittings are suspended at each corner of an ornamental laylight, while the first flight of stairs is illuminated by a specially designed three-tier wall fitting furnished with six 60 watt lamps. The metalwork of this is

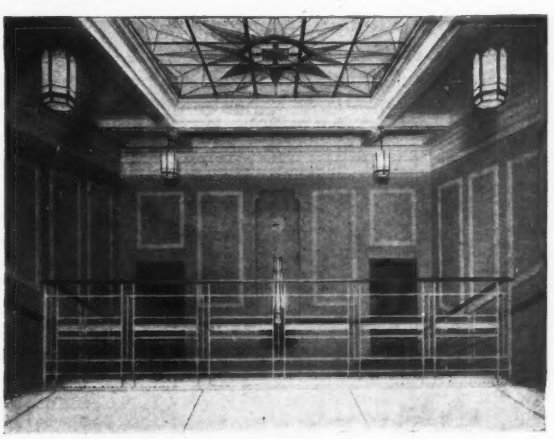


Fig. 2. Showing pendant fittings over the main staircase.

in polished copper with white and amber sprayed obscured rimpled glass, the base being finished in green.

The assembly hall is illuminated by eight four-point suspension octagonal fittings, the metalwork of which is finished bronze colour, with white flashed opal glassware and obscured glass dust covers.

The electrical installation of the sections referred to herein was carried out by Messrs. R. Darbyshire, Ltd., of Blackpool, the lighting scheme having been designed by The General Electric Co., Ltd., in collaboration with the authorities mentioned.

The Lighting Load

Value of the Lighting Load to Supply Undertakings — Upward Trend in Lighting Levels—Higher Illuminations mean Better Load Factors—Off-Peak Lighting Loads—The Tariff Question —Possible Future Progress.

In an informative paper presented to the Institution of Electrical Engineers on March 1, Mr. W. J. Jones showed how greatly the demand for lighting has developed during recent years, and how many of the ideas inherited from early days of electricity supply are no longer correct.

At an early date the fact of the lighting demand coming simultaneously with the power demand on winter afternoons was recognised to cause an inconvenient "peak." Methods of either (a) filling up the valleys in the load curve or (b) limiting the peaks so as to create a steadier demand were advocated. The search for "off-peak" load led to the development of heating and cooking, to which supply undertakings have devoted great attention. This, however, should not absolve them from also cultivating the lighting load, of which a fresh perspective is necessary.

It is not long since the view was expressed that the remaining small lighting consumers would not justify the capital expenditure involved in connecting them. Examination shows that this belief is unfounded. Moreover demands, even of small consumers, tend to grow. In Sunderland the average domestic consumption of the "assisted wiring class" has increased in two years from 175 to 341 units per annum. Investigations in Germany and the U.S.A. lead to similar results.

Value of Lighting Load.

From the statistics of the Electrical Commission (1935-6) it is deduced that lighting provides 77 per cent. of the revenue and 57 per cent. of the consumption for domestic and commercial purposes (heating, lighting and cooking). If street lighting is included revenue from lighting actually forms 50 per cent. of the total revenue obtained by supply undertakings.

The upward trend in the lighting level, noted above, is accompanied by an improvement in load factor because in some circumstances artificial light is not used until it is better than the daylight available. Better artificial light means, in fact, later switching off in the morning and earlier switching on in the afternoon.

Rebuilding schemes often involve supplementary artificial lighting. For example deep re-entrant shop windows result in electricity being used during many hours of daylight.

Increased Consumption and Off-Peak Loads.

Tables presented by the author show that in various areas domestic lighting consumption has doubled in the last twelve years. Surveys have shown that the wattage per frontage of series of shops increased by 150 per cent. in the same period and that the load factor had improved by 10 per cent. Dr. Adolph, in Berlin, remarks that tariffs which are favourable to lighting consumption encourage consumption outside peak-time and thereby improve the load-curve. Attention is also drawn to certain forms of lighting that form an inherently valuable off-peak load, e.g., public houses (which are not allowed to be open during the period 4.30 to 5.30 p.m.), schools, where evening classes do not commence until 6-7 p.m., and cinemas where a much larger amount of light is now used continuously in vestibules and restaurants, the load factor of the newer cinemas being as much as 20 per cent. or double that of the older ones.

Tariffs.

Turning to the question of tariffs the author remarked that the two-part tariff affords a good incentive for increased consumption, but the kVA basis of rating, or its equivalent number of lamps, should be rigidly excluded from negotiations with all except very large consumers as it imposes an unnecessary restraint on the installation of additional lighting. Tariffs may be modified with advantage to suit special conditions. Flexibility is desirable and much can be done to encourage display lighting, floodlighting, and electric signs, with terms approaching ½d. or 1d. per unit, provided the use continues from dusk to midnight.

Supply Undertakings Should Study Illumination.

Allusion was made to the inclusion of a requirement of adequate lighting in the Factory Act and to recent advances in street lighting. In general improvement in the luminous efficiency of light sources has coincided with increased consumption, but electric supply undertakings cannot expect this condition to continue indefinitely without positive promotional efforts on their part! In the last portion of the paper, therefore, the author urged the necessity of electrical supply undertakings studying lighting and forming development staffs to deal actively with this phase of consumption, such as exist in the United States. Reviewing in turn the fields of domestic, commercial, industrial, and street lighting he suggested that an objective consumption three to four times the present consumption might quite well be attained.

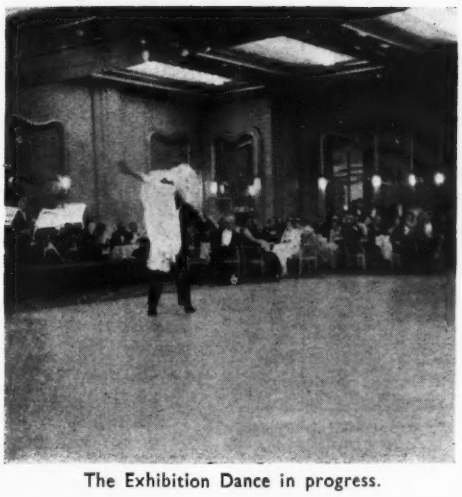
A Floodlighted Hotel

The new luminescent electric discharge lamps are already finding application for floodlighting. We reproduce above a view of the Plough Hotel, Sutton Common, where Siemens 400-watt luminescent "Sieray" lamps were used with good effect. Messrs. S. Rogers and Co., Ltd., were responsible for the installation.

Mr. S. J. Patmore.

Mrs. Patmore.

Snapshots at the I.E.S. Annual Dinner



The Exhibition Dance in progress.

We are indebted to Mr. Hugh S. Allpress for the accompanying pictures, taken with a small camera at the Annual Dinner of the Illuminating Engineering Society on March 15th. They illustrate how readily photographs and even snapshots can be taken by ordinary artificial lighting with the modern form of camera, provided rooms are also illuminated in modern standards.

Sir Alexander Maxwell proposing the toast of "The Illuminating Engineering Society."

Mr. Howard Long and Mr. F. Arnott in conversation.

When Lighting Was Young

Reminiscences of Early Experiments with Electric Discharge Lamps in London

by

Samuel G. Hibben

Mr. Samuel Hibben, whose address to the Illuminating Engineering Society in 1934 will be well remembered by many readers, recalls an early gaseous tube installation at the Savoy Hotel.

During the year just past some 70,000 mercury vapor electric discharge lamps went into service throughout Great Britain. During 1937 and including the preceding four or five years there has been a decided growth in production and usage of such illuminants, particularly the mercury vapor lamps operating at about atmospheric pressure, as one may especially note when observing the lighting of many of the thoroughfares of London and neighbouring cities. In fact it seems safe to say that more mercury vapor lamps are in service in this vicinity than in all the rest of the world taken together, and it might not be amiss to add that Greater London could properly be termed the cradle of this illuminant.

With this in mind it may be interesting to look some thirty years into the past, and to recall certain circumstances incident to the first demonstration installation of electric discharge lamps which in this country happened to be in the lobby of the Savoy Hotel.

Early in 1907 the late Dr. D. McFarlane Moore, of New Jersey, had developed a practical illuminant employing long lengths of glass tubing evacuated and filled to about 1/10 mm. pressure of carbon dioxide or nitrogen gas. Such continuous tubing ran to lengths of over 200 ft., usually in a return circuit whereof the two ends were terminated in a box or cabinet, housing a step-up voltage transformer, a gas generating apparatus and necessary operating accessories. Rather large carbon block electrodes were sealed into the ends of the tubing. Such lamps employed the general principle of an electric discharge resulting in the ionization of the enclosed gas and the emission of light of distinctive colour and, for that era, at particularly high efficiency (1.78 watts per candle).

Dr. Moore had delegated a Mr. Livingston as a business agent to introduce the Moore tube in London, and Messrs. Dickson and Banta, of the U.S.A., undertook in the spring of 1907 to install some 170 feet of tubing (a rectangle 60 by 24 feet) in the outer lobby or courtyard of the Savoy. Mr. W. P. Dickson, still active with the Westinghouse Lamp Division at Bloomfield, New Jersey, relates many amusing and interesting circumstances leading up to the consummation of the job.

His device required alternating current at fairly well regulated voltage, and only direct current seemed available in that portion of the City. An especial motor generator to provide the proper power was installed; then there were difficulties such as low voltage, the breakage of supporting insulators (suspension was 17 feet high), and the mechanical difficulties of sealing together and exhausting such a continuity of tubing as was erected in eight-foot lengths of 1¾ inches diameter. However, after some months of perspiration and prayer, the rectangular arrangement of tubing suddenly glowed with a warm golden colour; the diners at the restaurant tables were astounded with the agreeableness of the strong but shadowless illumination: the entrance to the Savoy sprung into brilliant radiance and the rubber-tiled carriage-way was trod by many feet of curious observers. What matters it now to note that the illumination at table-height was but one foot-candle? The thirty carbon filament glow lamps of thirty-candle-power each had previously provided 0.1 foot-candle!

The Moore Tube Lighting installation in the courtyard of the Savoy Hotel, London, described in the very first number of *Light and Lighting* (then the "*Illuminating Engineer*") in January, 1908.

Citizens of London in those days may recall the clusters of yellow flame arc lamps on poles as the predominant street-lighting fixture. As for the interior illumination, the carbon filament lamps served vicariously to supplement gas. In the Savoy lobby the illumination was vastly increased, and at an operating cost of about one-third of that for the services of the carbon filament illuminants. Three kilowatts represented the electrical load.

It is amusing to know that these early scientists, such as Mr. Dickson, enjoyed the official title of "glass plumber." The illuminating engineer was in embryo. Nevertheless, there was in print a magazine, "The Illuminating Engineer," in which, during January, 1908, appeared an account of these epochal happenings, described by Dr. J. A. Fleming, F.R.S., who prophetically remarked: "We may not yet have nearly reached the limits of possible efficiency by the use of suitable gaseous conductors."

History does not relate, nor does space suffice, to record all of the early happenings, but in July, 1907, the s.s. Kaiser Wilhelm Der Grosse carried back to the States the joyous report from Glass Plumber Dickson that London's first electric discharge lamp was successfully operating!

The Moore tube has given way to less cumbersome and slightly more efficient vapor lamps of higher pressure, but not of more pleasing quality. There is more than human interest in the story, because after some three decades we find those first principles of the discharge lamp applied once more to brightening London and in exemplifying the most efficient practical way that man has yet found of producing light.

The Lighting of Swimming-Pools

The lighting of public baths and swimming-pools, which are springing up all over the country, has become quite a specialised subject. An interesting feature at the Public Works Exhibition last year was a display arranged by the I.M.E.A. Institution of Municipal and County Engineers, descriptive of fifty-two selected baths and swimming-pools. Descriptions of these baths appeared in an illustrated guide. In most cases some form of artificial lighting is provided, and in some underwater illumination and decorative lighting also. By the aid of an adjustable roof many of them can be converted from open to closed baths, and the period of use throughout the year thus extended.

The Paris Illumination Conference (1937)

We note that the proceedings at the special international illumination conference held in Paris during June, 1937, have now appeared in volume form, under the editorship or Monsieur Jean Dourgnon. The volume is fully illustrated, contains over 350 pages, and records contributions by over fifty different authors. Prior to this conference, i.e., during June 18-20, the consultative photometry committee, associated with the International Illumination Commission, held a meeting in Paris, when a new unit of light, based on the brightness of a black body at the temperature of melting platinum, was proposed for international acceptance.

Intermittent Light Beacons

In a paper recently read before the Honourable Company of Master Mariners, and again at the Southampton Master Mariners' Club, Mr. Leslie G. Toplis recently described some of his work on beacons using intermittent light, and especially the so-called Sineterae fog beacon, which embodies the display of two adjacent lights in rapid alternation. One interesting observation, at Newhaven Harbour and elsewhere, was that the improved visibility of the special beacon, as compared with the ordinary flashing lamp source, depended in some degree upon distance. Subsequent experiments were made in the laboratory with the special tank devised by the author and Mr. Charles Cooper, in which a highly diluted emulsion of milk in water serves as an artificial fog. Many interesting points in physiological optics are connected with these problems; for example, the frequency giving best results, the comparative effect with images received on the centre or peripheral parts of the retina, and the apparent effect of mist and fog in slowing down or even eliminating a flicker effect.

National Safety Congress

For the Twenty-first Anniversary National Safety Congress, to be held in the Caxton Hall, Westminster, during May 24-28, a very full and varied programme of papers has been arranged. Lord McGowan will preside at the opening reception, after which H.R.H. the Duke of Kent will perform the formal opening ceremony. The programme is organised in five sections—Highway and Police, Transport, Education (Child Safety), Home Safety, and Industrial Safety.

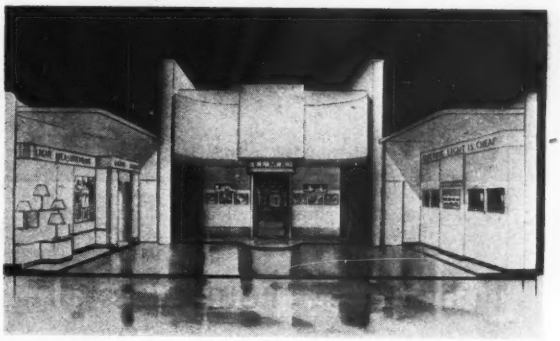
Illuminating Engineering Society (U.S.A.)

Thirty-Second Annual Convention

We learn that the thirty-second annual Convention of the Illuminating Engineering Society in the United States will this year be held in Minneapolis, "The City of the Lakes," where a varied programme of papers and social events has been arranged. The convention will occupy the period August 29 to September 1 inclusive.

E.L.M.A. Exhibit at the Empire Exhibition, Glasgow

We give below a picture of the E.L.M.A. display, forming part of the E.D.A.-E.L.M.A. exhibit at the Empire Exhibition, Glasgow. A feature of the display is the central revolving stand showing examples of the many types of lamps manufactured by



E.L.M.A. members. On each side are panels of designs constructed with coloured architectural lamps. There is also a cabinet in which a constantly moving, apparently infinitely long band of coiled-coil Pearl lamps are shown. The familiar Light-Sight-Tester will be again in evidence.

Long Life-Low Efficiency Lamps for Street Lighting

An interesting type of special tungsten lamp — the so-called "S" lamp — has recently been introduced for street lighting purposes in Switzerland. The highest items in a budget for street lighting maintenance are those for lamp replacement and wages. Accordingly, the "S" lamp is deliberately run at a somewhat low luminous efficiency, with the result that, for a given light-output, 15 per cent. more energy is required than for ordinary lamps, but an average life as high as 2,500 hours is secured. A record of the experience of the town of Zollikon, published in the *Bulletin Schweiz. Elektrotechn. Verein*, shows annual savings of 30 per cent. on labour and 60 per cent. on lamp replacement. This is offset to a certain extent by the 15 per cent. increased consumption. The total financial saving is reported to be approximately 6 per cent. It is, one would think, only in exceptional cases that sacrifice of efficiency for abnormal life of lamps is worth while. In extensive rural areas, however, cost of replacement is doubtless an important item.

Fifth British Glass Convention

The Fifth British Glass Convention is being held in Droitwich during May 18 to 21. Features of interest include the address by Dr. V. E. Yardley on "Plastics and their Relation to the Glass Industry," and an exhibition in which the well-known "Glass Age Exhibition Train" is included.

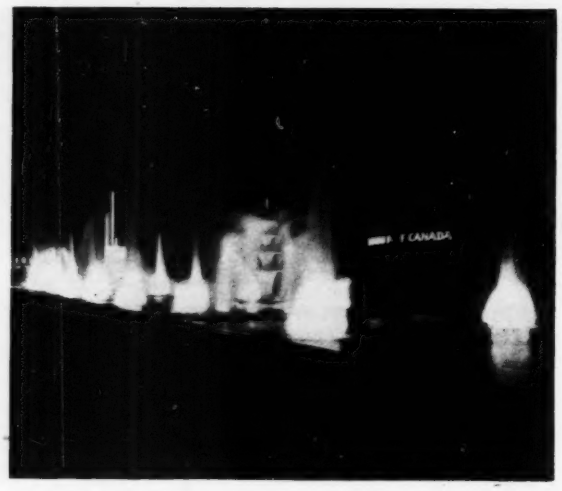


Fig. 1. Showing the eighteen subsidiary fountains and two flare fountains on the Great Lake.

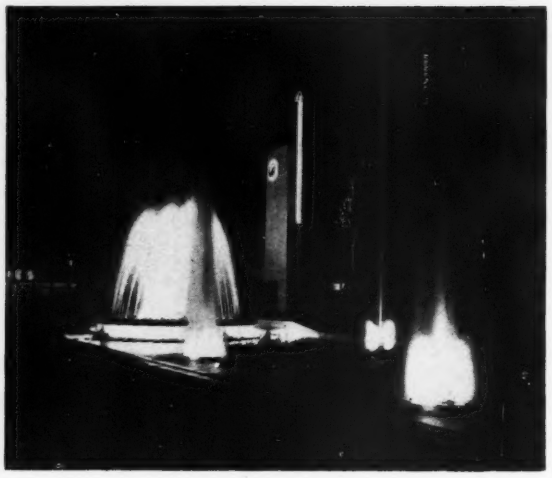


Fig. 2. The Circular Pool and subsidiary fountains on the Great Lake.

Illuminated Fountains at the Empire Exhibition, Glasgow

In our last issue we gave some account of the general and spectacular lighting at the Empire Exhibition, Glasgow. In what follows we present a specially contributed account of a striking water-lighting display.

The Edison Swan Electric Company, Ltd., who are pioneers in the development of colour changing fully automatic hydro-electric fountains, were responsible for the complete lighting installation of the Great Lake fountains scheme and the fountains opposite the Palace of Engineering. These fountains are not only the largest in the Empire Exhibition, but represent the greatest illuminated fountain displays ever constructed in the British Isles.

Elaborate displays of water, brilliantly lighted in ever-changing and blending colours of red, amber, green, and blue, form the main feature of the Great Lake scheme. The lake, which is rectangular in shape, is flanked on either side by eighteen "tulip-form" fountains, each having two distinct jet formations which can be operated individually or collectively. Between these eighteen fountains are two large "flare" fountains of striking design, which are fitted with water jets designed to project heavy sprays of water in tier formation. Set in the north end of the lake is a large circular pool from which water rises to a height of some thirty feet in the form of a tremendous cone. Water flowing over the lip of this pool and forming a heavy weir is illuminated from projectors concealed in the lake below. Behind this circular pool and at the extreme north end of the lake a projection chamber has been constructed to house a large battery of two-inch orifice water jets and a bank of floodlight projectors. These jets shoot out over the pool in a great arc some 100 odd feet in length, and the changing illuminations cause this water stream to appear as a huge rainbow and then as liquid gold and silver, etc.

The fountains in front of the Palace of Engineering are set in a pool almost square in formation, and built within this pool, but at higher levels, are two other circular pools in tier formation so arranged that the water flowing from one level to the other provides a magnificent cascade. In both schemes the water is reciprocated from the lower levels by means of Drysdale electrically operated pumps.

In the Great Lake scheme the pumps have a total output of 293 h.p., with a capacity of over 10,000 gallons of water per minute; whilst the Palace of Engineering water system involves the use of pumps having a total output of over 80 h.p., with a capacity of 4,000 gallons per minute. A number of the hydraulic valves are electrically operated and controlled in sequence with the lighting effects, so that a most wonderful combination of coloured illuminations and water effects can be obtained.

The most notable feature of these great fountain displays is the concealment of the light sources. To achieve this the Edison Swan Electric Company developed a special form of submersible floodlight

Fig. 3. General view, by daylight, of the Great Lake, showing the subsidiary fountains, two flare fountains, and the main fan jet projection chamber.

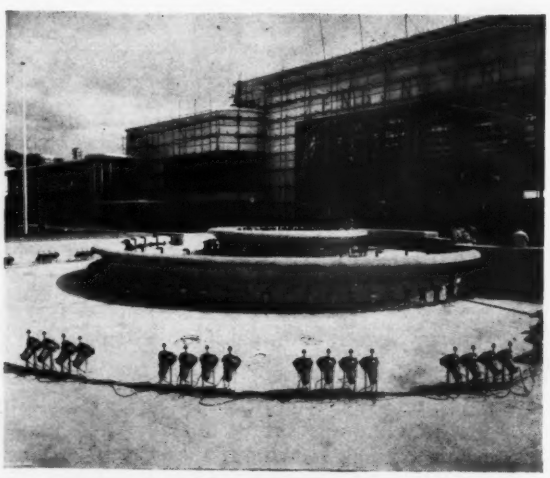


Fig. 4. A daylight view outside the Palace of Engineering, showing lighting equipment for fountains.

projection which can be completely submerged beneath water. Hitherto it has been necessary to fit underwater fountain projectors to breather pipes; but for this installation the difficulty and cost of so complicated an arrangement were overcome by equipping each unit with a small and inconspicuous breathing device which, whilst allowing the projector to breathe freely, thus avoiding the strains otherwise set up, still maintains the projectors foolproof against flooding.

As will be observed in the adjacent photographs, the projectors are arranged in various groups around the different water jet formations, each battery of projectors being divided into four colour groups of red, blue, green, and amber. These groups of projectors are connected to, and automatically controlled by, specially designed mercury switch type motor-driven control drums, the circuits being so arranged to give thirty-six different colour combinations. The period for each effect is approximately seven seconds. The control drums are of the variable type, so that if desired the sequence of colour effects can be changed from day to day.

For the Great Lake scheme over 700 Ediswan submersible fountain projectors are installed, these housing Royal "Ediswan" projector type or regular gas-filled lamps, according to their various duties. Some 200 similar units are used in the Palace of Engineering fountain displays.

The whole of the intricate circuit wiring has been laid under water, and Edison Swan tough rubber cables with special submarine type junction boxes have been employed throughout.

Mr. Arthur Mansell, of the Edison Swan Electric Company, Ltd., has been responsible for the design and installation of the complete electrical equipment, working in collaboration with Mr. Campbell Murray, M.I.E.E., consulting engineer, and Messrs. Crouch and Hogg, civil engineers.

Electric Street Lighting

Birkenhead.—Improved street lighting involving an expenditure of £5,831 has been approved by the Council, and the M.O.T. is to be approached in regard to a 50 per cent. contribution towards the capital and maintenance cost.

Bolton.—New sodium discharge lighting is to be installed in Higher Bridge-street, Blackburn-road, and Halliwell-road. A new lighting depot, costing £1,975, at the corner of Bark-street and Pool-street is also proposed.

Nuneaton.—The electrical engineer is to prepare a scheme to extend sodium lighting to Tomkinson-road and Haunchwood-road.

Stoke-on-Trent.—A diminution in accidents during hours of darkness on those stretches of road equipped with mercury discharge lighting is reported by the Chief Constable.

Sunderland.—The Corporation Electricity Committee proposes to reduce the street lighting charges by £2,000 per annum.

Public Lighting Engineer Wanted in Dundee

Our attention has been drawn to an advertisement which appeared in the Glasgow Herald on April 13, inviting applications for the position of public lighting engineer in Dundee. The salary offered is £360 per annum, rising by annual increments of £15 to £450. Applicants must not be more than 45 years of age and should forward copies of three recent testimonials. Applications should be endorsed "Public Lighting Engineer" and should be addressed to the Town Clerk (City Chambers, Dundee). Although our reference to this matter necessarily appears after the final date specified for the receipt of communications (May 5), we think it well to give publicity to this appointment, which may be of interest to some of our readers.

Street Lighting Extensions in Halifax

An Important Installation of Luminescent Discharge Lamps.

Electric street lighting continues to make rapid advances at Halifax, where a further installation of electric discharge lighting has recently been brought into commission in Northgate, Union-street, and Market-street. Nineteen 400-watt lamps have been provided in the shopping areas, and a further nineteen 250-watt lamps elsewhere, all of the luminescent type.

Every effort has been made to conform to the recommendations of the Ministry of Transport Final

Report, although local conditions made strict interpretation virtually impossible at one or two isolated positions.

Following the inception of the new lighting, the "Halifax Daily Courier and Guardian" devoted considerable space to a description of it, expressing a very favourable opinion of the effect of the colour-corrected mercury lamps employed.

Czecho-Slovak Electrotechnical Annual Convention

The twentieth anniversary of the Czecho-Slovak Electrotechnical Association will be celebrated at its annual convention, to be held in Prague from May 28 to May 31. A feature of the meeting will be the exhibition illustrating progress in electrification in Czecho-Slovakia during the past twenty years. There will be a series of papers on electrotechnical topics, divided into seven sessions. Revisions and supplements of the Czecho-Slovak Electrical Safety Code will be presented for ratification. Numerous visits to electrical installations, factories, etc., and agreeable social events have been planned. Further particulars may be obtained from the offices of the Association (Praha XII., Vocelova 3, Czecho-Slovakia).

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 99, April, 1938.)

II.—PHOTOMETRY.

109. Light Flim Measurement.

A. J. Small. Elect., 120, p. 375, March 25, 1938.

Details are given of the construction and use of a 36-inch diameter integrating sphere made from a submarine mine. C. A. M.

110. Theory of Colour-Photography: the Subtractive Process.

H. Frieser and R. Reuther. Zeits f. Techn. Physik, No. 3, pp. 77-85, March, 1938.

The first part of a detailed mathematical analysis of colour-photographic processes. W. R. S.

111. Electronics: Colour Photometry.

L.E.C.H. Elect., 120, p. 383, March 25, 1938.

A description is given of colour analysing apparatus that automatically records its results. C. A. M.

III.—SOURCES OF LIGHT.

112. Recent Developments in Gaseous Discharge Lamps.

S. Dushman. Electronics, 11, No. 3, p. 52, March, 1938; Soc. Motion Picture Engineers J., Jan., 1938.

The mechanism of light production in electric discharge lamps is described, and illustrated in detail by reference to the sodium vapour discharge. The use of fluorescent materials and the importance and form of practical discharge lamps, with their applications, are discussed. S. S. B.

113. Convection Currents in H.P.M.V. Arcs.

Carl Kenty. Electronics, 11, No. 3, p. 52, March, 1938; Journal of Applied Physics, January, 1938.

The effects of convection currents on heat losses and form of the arc in the H.P.M.V. arc have been studied by introducing minute incandescent oxide particles into the tube and tracing their paths photographically. By determining the direction and velocity of the vapour stream, an experimental aid to previous theoretical work has been developed. S. S. B.

114. Neon Light Displaces Incandescent Beacon.

C. H. Lindell. El. World, 109, p. 930, March 12, 1938.

A neon tube, attached to a high voltage transmission line, acts as a beacon, in place of the normal obstruction light. It operates by means of the capacity between plates attached to the tube and the ground below. The unit requires no supply other than the high voltage of the transmission line. Its range of visibility, however, was found to be less than that of the standard light. S. S. B.

IV.—LIGHTING EQUIPMENT.

115. Lighting Equipment.

Anon. Elect., 120, pp. 385-387, March 25, 1938.

Descriptions with photographs are given of new lighting equipment recently placed on the market. C. A. M.

116. Matching Light.

Anon. El. Journal, Vol. 35, No. 3, p. 116, March, 1938.

Tellurium vapour lamps of the arc discharge type produce a continuous spectrum. The colour of the radiation changes with alteration in the vapour pressure and temperature; the higher the operating conditions the more the colour is shifted towards the red end of the spectrum. Quartz bulbs have been used in experimental lamps. R. G. H.

117. Oscillating Beacons.

W. T. Harding. Am. Illum. Eng. Soc. Trans., 3, pp. 277-280, March, 1938.

Describes a type of beacon which is said to have been adopted by the U.S. Army Air Corps, in preference to the rotating type. The unit consists of a cylindrical Fresnel lens with its axis of symmetry vertical. The light source can be periodically lowered from and raised to the focus of the lens. A 360 deg. fan of light is thus produced, which rises and falls. Up to 80 indications per min. are possible. J. S. S.

118. Artificial Illumination of Glass Blocks.

C. S. Woodside. Am. Illum. Eng. Soc. Trans., 3, pp. 247-253, March, 1938.

Discusses the use of illumination of glass blocks in true and artificial windows. Attention is given to the use of figured and coloured backgrounds in the artificial window. J. S. S.

119. Plastics in Lighting.

F. W. Warner. Am. Illum. Eng. Soc. Trans., 3, pp. 244-261, March, 1938.

This paper discusses the use in lighting fittings of various organic plastics in moulded and laminated forms. Useful physical and optical data are given. J. S. S.

120. Plastics for Electrical Purposes.

A. R. Dunton, A.M.I.E.E. El. Times, 96, pp. 471-474, March 31, 1938.

A comprehensive account is given of modern plastics and their more important properties. W. R. S.

V.—APPLICATIONS OF LIGHT.

121. Light and Architecture.

Anon. Am. Illum. Eng. Soc. Trans., 3, pp. 219-226, March, 1938.

Some representative architectural lighting schemes are described with photographs. J. S. S.

122. Light for Modern Living.

Anon. El. Journal, Vol. 35, No. 3, p. 101, March, 1938.

Describes with photographs a room lighted entirely by artificial means, to give the shadowless lighting associated with daylight, and also to give a number of changes of colour and of level of illumination. R. G. H.

123. New Lighting at the Old Bailey.

March 11, 1938.

The new lighting at the Old Bailey was designed by giving consideration separately to each section of the building in relation to its function. Floodlighting and concealed cornice lighting have been installed where architectural features merit such treatment. R. G. H.

124. Adequate and Suitable Illumination.

"Pharos." Elect., 120, p. 377, March 25, 1938.

The various factors governing minimum standards of illumination values for the new Factory Act are discussed in detail. C. A. M.

125. Good Industrial Lighting.

Anon. El. Times, 93, p. 477, March 31, 1938.

Three situations, a forgings heat-treatment shop, a galvanised goods warehouse, and a large boiler-making

shop, have been lit with high-pressure mercury-vapour discharge lamps. Illustrations and installation data are given. W. R. S.

126. Fifty-five Foot-candles for Radio Production.
J. V. Gaynor. El. World, 109, p. 1,086, March 26, 1938.

An unusual installation is described, in which closely spaced general lighting units are used instead of local lighting in an American radio factory; 500 watt units at 5 feet centres are used, and an illumination of 55 foot-candles is claimed. S. S. B.

127. Modern Lighting and Air-conditioning.
W. Sturrock. Magazine of Light, VII., No. 3, pp. 15-20 and 36, March, 1938.

A discussion is given on the effect of modern artificial lighting on the temperature rise that must be considered in designing the cooling system. C. A. M.

128. Store Lighting.
R. W. Morris. Magazine of Light, VII., No. 3, pp. 6-11, March, 1938.

Details, with photographs, are given of three modern installations of store lighting equipment in America. C. A. M.

129. Show Window Lighting.
Anon. Magazine of Light, VII., No. 3, pp. 26-27, March, 1938.

An unusual show window, with a circular revolving stage, displays furniture receiving illumination values of 120-200 foot-candles. The light is provided by two concentric rings of 200 watt recessed fittings at a spacing of two feet. C. A. M.

130. Modern Lighting Installations.
Anon. El. Times, 93, p. 416, March 17, 1938.

Gives photographs and a brief description of council chamber, street-lighting, bowling green, and colour church-lighting installations. W. R. S.

131. Sodium Street-lighting at Hornsey.
Anon. El. Times, 93, pp. 429-430, March 24, 1938.

Gives details, with illustrations, of a recently installed sodium and tungsten-filament street-lighting at Hornsey, London. W. R. S.

132. Switchyard Lighting Helps Operators.
R. A. Potter. El. World, 109, p. 727, February 26, 1938.

A brief description is given, with illustration, of the lighting provided at an outdoor switching station of an American electricity supply company. S. S. B.

133. Trends in Aviation Lighting.
F. C. Breckenbridge. Am. Illum. Eng. Soc. Trans., 3, pp. 262-276, March, 1938.

The paper describes the developments in aviation lighting during the last few years. The chief developments in America are concerned with high-angle beacons, beacons for close spacing, and runway marker lights. Detail improvements in other directions are mentioned. J. S. S.

134. The Empire Exhibition.
W. Cruickshank. El. Rev., Vol. CXXII., No. 3,146, p. 348, March 11, 1938.

Describes the arrangements for lighting the Empire Exhibition at Glasgow. Prominent features will include large luminous signs, illuminated waterfalls, and flood-lighting of trees. R. G. H.

135. Edison Tower.
Magazine of Light, VII., No. 3, pp. 1-2 and 4, March, 1938.

Details, with a photograph, are given of a luminous tower 131 feet high. C. A. M.

136. Sydney Celebrations.
Anon. Elect., 120, p. 443, April 8, 1938.

A series of photographs is given, showing various lighting effects produced at the recent celebrations at Sydney. C. A. M.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 479,307. "Improvements in and Relating to Lamps for Street Lighting and the Like."

Foster and Pullen, Ltd., Stevenson, H. R., and Woolfenden, D. J. Dated August 26, 1936.

This specification relates to street and like gas lighting lamps employing a "strip light" and having upper and lower reflectors at each side of the light source. According to the specification an additional fixed reflecting surface is combined with fixed upper and lower reflectors with its inner edge abutting on or adjacent to the outer edge of the upper reflector and inclined downwards with respect to the upper reflector. The additional reflector may form a continuation of the upper reflector.

No. 479,424. "Improvements in Electric Discharge Lamps."

N. V. Philips, Gloeilampenfabrieken. Dated September 24, 1936. (Convention, Germany.).

This specification covers a high-pressure mercury vapour discharge tube housed in a glass bulb and having a loading exceeding 10 watts per cm^2 of the tube wall surrounding the discharge path. Phosphorescent material is provided in or on the glass wall of the bulb which has a surface which is at least $10 \times (B + 15)^{2/3}$ cm^2, and preferably more than $12 \times (B + 15)^{2/3}$ cm^2, where B is the load of the tube in watts. The reasons for this relationship are given in the specification.

No. 479,662. "Improvements in or Relating to Devices for Measuring and/or Indicating the Diffusion of Light in, or the Turbidity of Fluids and Other Transparent Media."

Gas Accumulator Company (United Kingdom) Limited. Dated July 11, 1936. (Convention, Sweden.)

This specification covers a method and apparatus for measuring the degree of light diffusion in a fluid in which two light sensitive devices, such as photo-electric cells, are arranged in the path of light rays passed through the fluid, in such a manner that increased light diffusion produces a proportional increase of the illumination of one of the devices and decrease of the illumination of the other device and vice versa. In particular the light issuing from a column of fluid is focused through an aperture of one light sensitive device and falls on the other. Diffusion causes the light to extend beyond the aperture of the first device so as to illuminate it and robs the second device of light correspondingly.

No. 479,697. "An Improved Adjustable Mounting for "Electric Lamps."

Chance Brothers and Co., Limited, and Stacey, N. A. W. Dated, November 4, 1936.

According to this specification a socket for supporting a lamp or its holder adapted to permit the latter to be adjusted in the direction of the longitudinal axis of the socket is carried upon a lever which in turn is pivoted upon a second lever, the pivots of the two levers being at right angles. An adjusting screw inter-connects the two levers to permit movement of the lamp holder in one plane, while the second lever has an adjusting screw for moving the lamp in the other plane. The appliance is particularly suitable for cases where accurate positioning of the lamp is required.

No. 479,722. "Improvements in or Relating to Lamps for Illuminating and Irradiating Surgical Operating Tables.

Paschoud, H. Dated, May 9, 1936. (Convention, Switzerland.)

A lamp for illuminating and irradiating surgical operating tables, according to this specification, comprises a reflecting system and a source of visible illumination and one or more sources of irradiation (e.g., infra-red or ultra-violet). The rays from the source or sources of irradiation are reflected only from a pair or pairs of oppositely disposed arcuate elements each subtending less than 180°, the arrangement being such that an area irradiated by the rays reflected by the elements is also illuminated by rays reflected from the source of illumination. The reflecting system may comprise a ring of reflectors and screens may be provided to prevent the irradiation from falling on parts of the ring.

No. 479,733. "Improvements in or Relating to the Manufacture of Activated Electrodes for Photo-Electric Cells or Secondary Electron Multipliers."

Zeiss Ikon Aktiengesellschaft. Dated, July 4, 1936. (Convention, Germany.)

This specification describes photo-electrodes which are made by vapourising an alkali metal such as caesium on to a layer of metal of greater conductivity (e.g. silver) and then coating the alkali metal with a thin layer of metal of lower conductivity than the alkali metal (e.g., bismuth, antimony, and lead). The sensitivity is said to be increased by coating the alkali metal layer with a metal of lower conductivity.

No. 479,825. "Photo-Voltaic Cells."

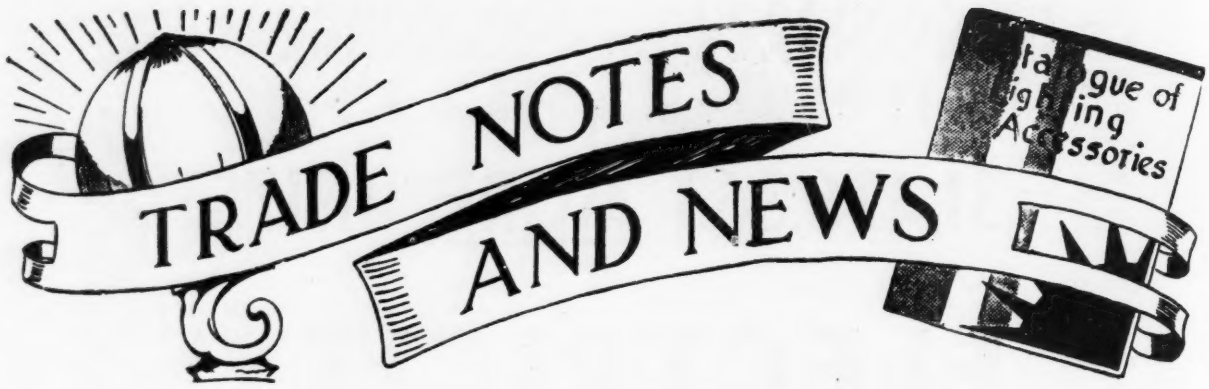
Electrical Research Products, Inc. Dated June 25, 1936. (Convention, U.S.A.)

This specification covers a photo-voltaic cell comprising contiguous layers of thallium and thallium treated with sulphur (thallium sulphide) and a separate electric connection from each of the layers to an external circuit. The thallium layer may be deposited upon a metallic base and the sulphide layer may be sputtered with a light transmitting film of platinum or gold.

No. 480,234. "Method of Supplying Current to High-Pressure Metallic Vapour Arc Lamps."

Egyesült Izzólámpa Es Villamossági Részvénytársáság. Dated, July 30, 1936. (Convention, Hungary.)

In order to modify the colour of light emanating from high-pressure metallic vapour arc lamps without causing serious over-loading and explosion of the lamp, a lamp is, according to this specification, supplied with current impluses the maximum current strength of which is a multiple of the strength of the sinusoidal alternating current which is necessary in order to enable the lamp to produce light of its normal basic colour. The time intervals between successive impluses are preferably a multiple of the duration of the impluses themselves.



A Novel Railway Lantern

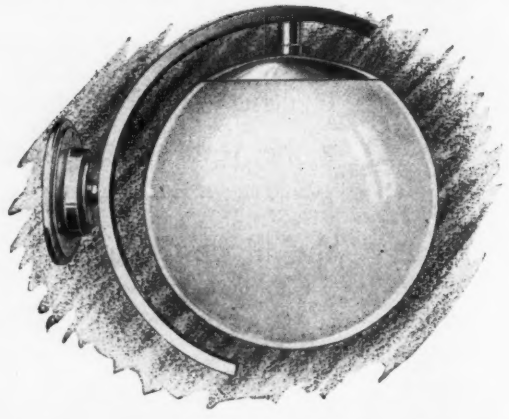
Can passengers be attracted by brighter stations? There is reason to think so, and much care has recently been devoted to lanterns for railway stations, which need special design. The L. and N.E. railway seem to be taking up the new Ediswan "Concourse" lantern, here illustrated, on a big scale. This lantern is already to be seen in use at Liverpool Street, King's Cross, and some lesser stations. Its success is largely due to the recognition that lighting a railway concourse is a different problem from street lighting. Whilst giving the necessary downward illumination, some light must be directed on the roof, so as to create a cheerful impression and avoid the so-called "tunnel effect." The glassware to achieve this effect must screen the filament sufficiently to eliminate glare, but must not be too dense nor absorb too much light. The solution lies in the adoption of a single piece of glass, the upper part of which is opalescent, whilst the lower flat bottom has an effect resembling that in the "pearl" lamp. The top half thus acts largely as a reflector, but it allows a fraction of the light to penetrate upwards.

The support of the globe on a cast metal ring is achieved by means of two studs at 120° spacing, engaged by a quick release latche placed at a further 120°. No screws are needed, and the fastening is quite positive. To facilitate cleaning, the latche is simply released and the whole assembly lowered on a pair of "slow tongs," leaving the cleaner's hands free. Another feature of considerable interest to railway engineers is the anti-condensation device fitted to the uppermost point of the lantern, which deflects moisture clear of the lamp contacts.

The lantern has recently been adapted for use with the Ediswan "Escura" luminescent discharge lamp, which, with its improved colour rendering, is likely to prove an acquisition for railway lighting.

A Pleasing Wall Bracket

We illustrate here a pleasing form of wall bracket, one of the series of "Sphere" fittings introduced by Siemens Electric Lamps and Supplies, Ltd. In the list before us pendants



with three-ply diffusing glass globes and either rod or chain suspension are listed. The range of this type of fitting has been considerably extended and now includes examples of practically all types likely to be in demand.

Football practice by Gas Lighting

Practice at football and other games is a real problem during the winter, when hours of daylight are short. An enterprising step—the installation of gas lighting on part of their field—has been taken by the Saracens Football Club, one of the oldest in London. Four 12-light Kempton "Kampar" flood lanterns are being hired from the Tottenham and Edmonton Gas Company and are mounted in line 12 ft. high. We are indebted to the *Gas Journal* for the accompanying illustration showing the lights in operation. For scrummage practice, "lines out" of touch, passing, and dribbling the arrangement answers quite well.

The Illuminating Engineering Society (U.S.A.).

Notes on the Current Transactions (March, 1938).

NEWS: The ninety-first anniversary of the birth of Thomas Alva Edison was commemorated by the dedication of the new *Edison Memorial Tower*. This is a 117-ft. concrete shaft bearing a giant replica of his first practical incandescent lamp, 9 ft. in diameter, 14 ft. high. The illumination is effected by eight incandescent lamps of a total wattage of 4,800, controlled by photoelectric cells which switch on automatically on sunset and switch off at dawn. The tower contains the "Eternal Light" set aglow on the occasion of "Light's Golden Jubilee," in 1929. Presumably the *highest illumination values for a bridge* have been achieved on the new bridge between Easton, Pa., and Phillipsburg, N.J., ranging between 2 and 3 foot-candles. Length of bridge a quarter of a mile, width 60 ft., light points 85 incandescent lamps 25,000 lumens each.

SUBJECTS OF PAPERS: *Artificial Illumination of Glass Blocks.* (Author, C. S. Woodside.) The paper gives detailed results of investigations referring to the physical and optical properties of glass blocks available on the market. Several examples of application are discussed, where glass blocks are used as walls for buildings, or for decorative purposes only, and recommendations given with regard to position and dimensions of the respective lighting arrangements. The need for similar investigations with regard to natural lighting is emphasised.

Plastics in Lighting. (Author, Frank W. Warner, Jr.) A detailed survey of the application of plastics in the lighting field is made. Phenolic plastics are now available in sheets of a thickness down to 0.06 in. and a transmission up to 45 per cent. similar to that of flashed opal glass. Urea plastics, described as superior to the former in that they are available in light colours, can be obtained in minimum thickness of 0.025 in. and maximum transmission of 67 per cent. Cellulose acetate transmits ultra-violet radiation down to 2,900 A., and is largely used in safety glass (about 75 per cent. of the whole production). The very latest product in this field is methyl methacrylate. The softening temperature of this is higher than that of cellulose acetate (more than 70°), it is available in all colours, and is unaffected by weather conditions of any description. Transmission values range up to 95 per cent. in the visible spectrum.

Trends in Aviation Lighting. (Author, F. C. Breckenbridge.) Complete aerodrome lighting equipment and navigation lights are reviewed and their historical development summarised. An interesting feature in this connection is the approach lights, which are located in line with the runway, but outside the actual aerodrome. They consist of fourteen 5 ft. 8 in. long neon tubes, 100 ft. apart, parallel to each other, and vertical to the runway axis, the first tube lying at the end of the runway. The author does not support the view that the development of radio piloting will displace illuminating signalling entirely. Luminous signals in certain applications to-day do, however, form "the second line" of defence in the safety provisions for air traffic.

Index to "Where to Buy"

N.B.—The numbers are those attached to individual entries in the Directory (See pp. 131-133).

Spotlighting with Gas

An illustrated leaflet issued by Messrs. C. H. Kempton and Co., Ltd, illustrates the illuminated clock outside the offices of the Ramsgate Corporation Gas Dept. mentioned in our last issue (p. 96). The "Elm" spotlight supplied by Messrs. C. H. Kempton and Co. for use in this installation is giving excellent results, no trouble at all being experienced, even during recent heavy gales. The consumption of this unit is only 2.5 cub. ft. of gas per hour and the polar curve shows a candle-power as high as 2,000 with the maximum concentration of beam.

Lighting of St. James Road, Battersea

We learn that the reference in our March issue (p. 68) to the lighting of the above thoroughfare by sodium lamps is incorrect. The lighting is actually by Osira high pressure mercury vapour lamps, of which 85 units have been installed.

Courses in Illuminating Engineering

The issue of the City and Guilds syllabus for examinations in Illuminating Engineering will no doubt lead to courses of instruction being organised. We learn that a three years' course at the South East London Technical Institute (Lewisham High Road, London, S.E.4) is already in prospect. The lectures on Illuminating Engineering will be given by Mr. J. B. Harris, who is also preparing a correspondence course on the subject.

"Old Cromptonians" Annual Dinner

The Annual Dinner of the "Old Cromptonians" will be held at the Trocadero Restaurant (Piccadilly Circus, London, W.1.), on Friday, May 20, when Colonel R. E. Crompton, C.B.E., F.R.S., will preside. Further information may be had on application to the Honorary Secretary of the Association, c/o Messrs. Crompton, Parkinson, Ltd., Bush House, London, W.C.2.

New Gas Lighting in Holborn

A street lighting installation of exceptional interest has been erected for the Holborn Borough Council in Woburn-place by the Gas Light and Coke Company. The installation was erected to the specification and plans of Mr. J. E. Parr, A.M.Inst.C.E., the Borough Engineer and Surveyor. The lamps are of the new "Magnalux" type using low pressure gas, first exhibited at the A.P.L.E. Conference at Folkestone in September, 1937, (It may be recalled that this lamp works on a novel principle, efficiencies comparable with those associated with high pressure being attained on an ordinary supply. A "self-burning" mixture of gas and air passes through the meshes of the mantle, the supply of secondary air being provided by two thermal syphons, the action of which is unaffected by wind.)

The installation comprises seven four-mantle lamps on bracket arm columns giving 25 ft. height to the light source, while three double arm columns each carrying two three-mantle lamps have been fixed on refuges.

The lamps are spaced approximately 90 ft. apart, the road width being 48 ft. They are fixed on 8 ft. bracket arms, giving 6 ft. outreach beyond the kerb, and central sources are placed on the refuges. They are at present hand-controlled, but can be worked by a modern type of clock control; experiments with this method are being made.

The output per 100 ft. length of road exceeds 15,000 lumens, and the test point illumination averages slightly below 0.5 foot candles.

This new installation, as may be seen from the photograph, provides very good visibility, and is regarded as probably one of the best examples of low-pressure gas street lighting in the world.

Typerlite Local Units

We understand that the Gas Light and Coke Company are now using a considerable number of "Typerlite" local lighting units for their various mechanised office appliances.

Contracts Closed

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—*The Admiralty* and the *London and North-Eastern Railway*: For twelve months' supply of Siemens electric lamps of numerous types.

Public Lighting With Gas

The re-lighting of Grange-road and Margate-road, Ramsgate, has now been completed; thirty-six 6-light low pressure lamps are being installed in the former road, and thirty lamps of a new pattern, fitted with automatic ignition, on the latter.

About 1,204 gas lamps are involved in a renewal of the contract for gas lighting by the Morecambe and Heysham Borough Council. Various improvements in lighting are specified in the new agreement.

Hawick Town Council has entered into a ten-year contract for public lighting with gas on the Greenheads Housing Estate.

About 938 lamps are affected by a recent contract specifying improved gas lighting entered into by the Sunderland Corporation.

Gloucester Docks are the subject of a new contract for a period of five years, which provides for the modernisation of the existing gas lighting. The new lighting will consist of forty-six lamps fitted with reflector and clock controllers.

Dunster, the Somerset beauty spot, is to have gas lighting for the first time.

Recent contracts include or renewals of agreements relate to Cirencester, Newtonwards (254 lamps), Wellington (335 lamps), Hawkhurst (Kent), Sandbach (Cheshire), Woodhall Spa, Sheerness, Swaffham, Alfreton, South Wingfield, Loddon, Brandon, Clonmel, and Galston.

Catalogues and Advertising Literature

We invite all firms in the Lighting Industry to send us new catalogues as they appear, for reference in these columns.

BRITISH COMMERCIAL GAS ASSOCIATION.—"Light on the Roads."—An illustrated handbook explaining, with diagrams, how to comply with the Recommendations of the Ministry of Transport's Street Lighting Committee. Also "The Factories Act, 1935"; the chief requirements in regard to heating, lighting, and ventilation are summarised, and numerous pictures of modern gas installations are presented.

COMPAGNIE DES LAMPES (PARIS).—"Le Tour de France de la Lumière."—An excellently produced volume containing data and night photographs of over 100 floodlighting installations in France.

ENGINEERING AND LIGHTING EQUIPMENT COMPANY, LTD.—Illustrated leaflet devoted to street lighting with sodium lamps.

SIMPLEX ELECTRIC COMPANY, LTD.—Catalogue of Ironclad Switch and Fuse Gear; also Creda Electric Water Heaters.